2x4	Standard or better	10	24	24	12	24
2x6 or larger	No. 3 & better	10	24	24	16	24

N/P = Not permitted.

Note: A 3-story frame house with walls constructed of 2 x 4 standard grade studs would require a 12-inch stud spacing on the lowest level, a 24-inch stud spacing on the intermediate level, and a 24-inch stud spacing on the upper level.

Question: *Based on Table 21.25-A, if I have an exterior gable end-wall with a cathedral ceiling that is greater than the stud height allowed, do I have any options other than cutting the studs and installing double top plates?*

Answer: *Yes, if the allowable height is exceeded, there are two ways of handling this condition:*

1. *If the maximum allowed stud length is 10 feet,* ***continuous 2" full-depth solid wood blocking*** *could be installed throughout the wall between all studs at the mid-point of the wall height (but in no case exceeding the 10' limitation).*

2. *The second option would be to install solid wood sheathing material on both the exterior and the interior of this stud wall, covering the entire wall area (under the interior wall finish).*

(b) Bracing. Exterior walls shall be braced at the corners.

1. Nominal 1-inch by 4-inch continuous diagonal members set into the face of the studs at an angle between 45° and 60°; or

2. Four feet by 8 feet plywood sheathing panels not less than 5/16 inch thick for 16-inch stud spacing and not less than 3/8 inch thick for 24-inch stud spacing; or

3. Preformed metal T-bracing not less than 22 gage (.0296 inches) thick and 1 3/4 inches wide; or

4. Other approved wind bracing materials.

Note: See Appendix for acceptable nailing schedule.

Corner Bracing

Question: *Is the required wind bracing allowed to be installed at other locations than the corners?*

Answer: *Yes, if the design of the dwelling prevents wind bracing at a corner due to windows or other features, then it may be located at the next available wall space. The purpose of the bracing, to reduce racking or the movement of the top of the house relative to the bottom, would still be served.*

(2) TOP PLATES. (a) General. Except as allowed under subd. 3., top plates shall be provided and configured as follows:

1. Studs at bearing wall shall be capped with double top plates.

2. End joints in double top plates shall be offset at least 2 stud spaces.

3. Double top plates shall be overlapped at the corners and at intersections of partitions.

4. The plate immediately above a stud may have a joint only when directly over the stud.

(b) Notching and boring. 1. When piping or ductwork is placed in an exterior wall or an interior load-bearing wall, such that at least half of the width of the top plate is removed, the plate shall be reinforced with a steel angle at least 2 inches by 2 inches by 20 gauge thick.

Note: 20 gauge is approximately 0.036 inch.

2. The steel angle shall span the gap and extend at least to the midpoint of the adjacent stud spaces.

3. Other equivalent materials may be used in accordance with s. Comm 21.02.

(c) Exceptions. 1. A single top plate may be used in place of a double top plate provided a rafter is located directly over the studs and the plate is securely tied at the end joints, corners and intersecting walls. Joints may occur in single top plates only when directly over a stud.

2. A continuous header, consisting of two 2-inch members set on edge, may be used in place of a double top plate provided the header is securely tied to the adjacent wall.

(3) WALL OPENINGS. Where doors or windows occur, headers shall be used to carry the load across the opening.

(a) Header size. The size of headers shall be determined in accordance with the spans and loading conditions listed in Tables 21.25-B, 21.25-C and 21.25-D. Headers for longer spans shall be designed by an engineering method under s. Comm 21.02.

TABLE 21.25-B

ALLOWABLE SPANS (FEET) FOR HEADERS SUPPORTING
ROOF/CEILING ASSEMBLIES*

House Width (feet)	Header Members									
	Two 2 x 4s		Two 2 x 6s		Two 2 x 8s		Two 2 x 10s		Two 2 x 12s	
	Zone 2/Zone 1		Zone 2/Zone1		Zone 2/Zone 1		Zone 2/Zone 1		Zone 2/Zone 1	
24	2.5	2.5	4	4	5	5	7	6	9	8
26	2.5	2	4	3	5	5	7	6	8	7
28	2.5	2	4	3	5	4	6	6	8	7
30	2.5	2	4	3	5	4	6	6	8	7
32	2	2	3	3	5	4	6	5	7	7

TABLE 21.25-C

ALLOWABLE SPANS (FEET) FOR HEADERS SUPPORTING ONE FLOOR*

House Width (feet)	Header Members				
	Two 2 x 4s	Two 2 x 6s	Two 2 x 8s	Two 2 x 10s	Two 2 x 12s
24	2.5	4	5	6	8
26	2.5	3	5	6	8
28	2	3	5	6	7
30	2	3	4	6	7
32	2	3	4	5	7

TABLE 21.25-D

ALLOWABLE SPANS (FEET) FOR HEADERS SUPPORTING ONE FLOOR
AND ROOF/CEILING ASSEMBLY*

House Width (feet)	Header Members									
	Two 2 x 4s		Two 2 x 6s		Two 2 x 8s		Two 2 x 10s		Two 2 x 12s	
	Zone 2/Zone 1		Zone 2/Zone1		Zone 2/Zone 1		Zone 2/Zone 1		Zone 2/Zone 1	
24	1.5	1.5	3	2.5	4	3	5	4	6	5
26	1.5	1.5	2.5	2.5	3	3	4	4	5	5
28	1.5	1.5	2.5	2.5	3	3	4	4	5	5
30	1.5	1.5	2.5	2.5	3	3	4	4	5	5
32	1.5	1.5	2.5	2	3	3	4	4	5	5

* These tables are based on wood with a fiber bending stress of 1,000 psi. For other species with different fiber bending stresses, multiply the span by the square root of the ratio of the actual bending stress to 1,000 psi. Example: From ~~Table 21.25-~~B, the allowable roof/ceiling span for a 28-foot wide house in zone 2, using two 2 x 8 header members with a 1400 psi bending stress, is 5 feet x $\sqrt{1400/1000}$ = 5.9 feet.

(b) Header support. Headers in bearing walls shall be supported in accordance with subd. 1. or 2. or 3.

1. Headers 3 feet or less in length shall be directly supported on each end by either:

a. The single common stud and a shoulder stud; or

b. The single common stud with a framing anchor attached.

2. Headers greater than 3 feet but less than or equal to 6 feet in length shall be directly supported on each end by the single common stud and a shoulder stud.

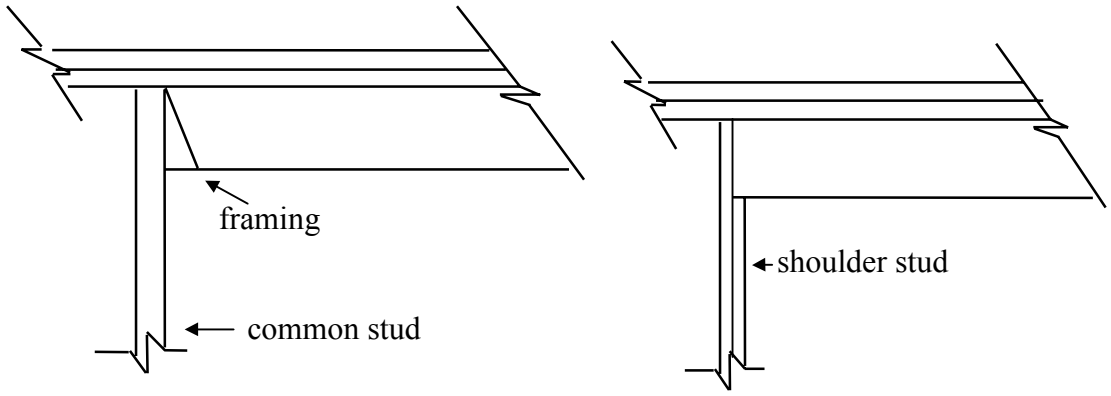
3. Headers greater than 6 feet in length shall be directly supported on each end by the single common stud and 2 shoulder studs.

Header Sizing

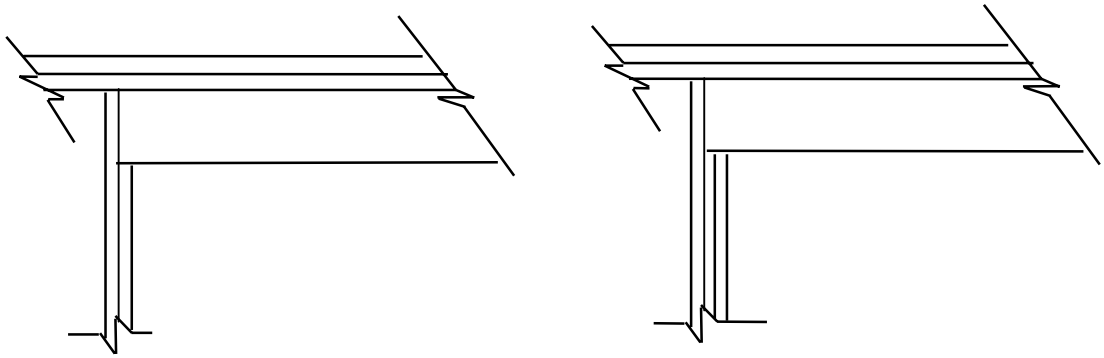
For headers exceeding the spans given in Tables 21.25-A, C, and D, see s. 21.22(3) of this commentary for design information.

Header Support

This section prescribes header support standards. The following diagrams are intended to clarify the text.. Remember that the "span" is the clear span plus ½ the required bearing area of the header at each end.



Either option for up to a 3-foot span.



From 3- to 6-foot span

Greater than 6-foot span

(4) NOTCHING. Notching and boring of columns or posts is prohibited unless designed through structural analysis. Studs shall not be cut or bored more than 1/3 the depth of the stud, unless the stud is reinforced.

(5) PARTITIONS. Load-bearing partitions shall be placed over beams, girders, or other load-bearing partitions. Load-bearing partitions running at right angles to the joists shall not be offset from the main girder or walls more than the depth of the joist unless the joists are designed to carry the load.

(6) POSTS AND COLUMNS. (a) General. 1. Posts and columns shall be installed to resist imposed loads.

2. Posts and columns shall bear directly over the middle 1/3 of a footing.

3. Posts and columns shall be restrained at the top and bottom to resist displacement.

4. Posts and columns that use a height adjustment mechanism shall have the mechanism imbedded in concrete or permanently disabled after installation.

(b) Bearing surface. Posts and columns shall have a steel bearing plate affixed to one or both ends to distribute any applied loads and to prevent fiber crushing of any structural member being supported.

(c) Steel posts or columns. Steel posts or columns shall be sized according to one of the following methods:

1. Manufactured columns shall follow the manufacturer's testing and listing.

2. Columns made solely of steel pipe stock shall follow Table 21.25-E.

3. Columns made of steel stock, not meeting the requirements of subd. 3. a. or b., shall follow a nationally accepted design specification or the size shall be determined through structural analysis or load testing.

(d) Wood posts or columns. Wood posts or columns shall be sized according to Table 21.25-F or the size shall be determined through structural analysis or load testing.

Table 21.25-E

COLUMNS MADE OF STEEL PIPE STOCK [1,2]

Column Diameter (inches)	Wall Thickness (inches)	Weight/ft (pounds)	Height (feet)	Allowable Load (pounds)
3	0.216	7.58	8	34,000
			10	28,000
			12	22,000
3.5	0.226	9.11	8	44,000
			10	38,000
			12	32,000
4	0.237	10.79	8	54,000
			10	49,000
			12	43,000
5	0.258	14.62	8	78,000
			10	73,000
			12	68,000
6	0.280	18.97	8	106,000
			10	101,000
			12	95,000

Note 1: This Table is based on a yield strength or Fy of 36,000 psi.

Note 2: This table is for columns made solely of steel pipe stock. The addition of any adjustment mechanism or other feature will alter the load-carrying capacity of the column.

Table 21.25-F

WOOD COLUMNS

Wood Nominal Size (inches)	Cross Section Area (inches)	Height (feet)	Allowable Load (pounds)
4 x 4	12.25	8	4,900
		10	3,100
		12	2,150
4 x 6	19.25	8	7,700
		10	4,900
		12	3,400
6 x 6	30.25	8	30,000
		10	18,900
		12	13,300

Note: This Table is based on a modulus of elasticity or E of 1,000,000 psi and a fiber bending strength or Fb of 1,000 psi.

Telescoping Columns

Question: *Are telescoping/expandable jacks or columns allowed in the construction of one- and two-family dwellings?*

Answer: *The use of the telescoping jack post (adjustable height columns) to support beams is not prohibited by the UDC provided they are capable of supporting the imposed loading. The installation shall comply with the manufacturer's installation instructions for spacing, load capacity, maximum height adjustment, beam or footing anchorage and proper method to secure the adjustment device while in service. The adjustable jack should be stamped or bear a sticker which indicates its allowable load. They must be secured at both the top and bottom of the column the same as any other column.*

Comm 21.26 Masonry walls.

Masonry walls shall be constructed in accordance with the requirements of this section.

(1) COLD WEATHER WORK. In cold weather, provisions shall be taken to prevent masonry from being damaged by freezing.

Note: It will be the practice of the department to accept performance with "Recommended Practices for Cold Weather Masonry Construction," available from International Masonry Institute, 823 15th Street NW, Washington, D.C. 20005.

(2) MASONRY UNITS. (a) Unused concrete units. Previously unused concrete masonry units shall conform to the ASTM C 90 standard.

(b) Unused clay or shale units. Previously unused clay or shale masonry units shall conform to the appropriate ASTM standard: C 62; C216; or C 652. Units which will be exposed to weathering or frost action shall be Grade SW as specified in these standards.

(c) Used masonry units. All previously used masonry units shall be free from physical defects which interfere with the installation or impair the structural properties of the unit.

(3) TYPES OF MORTAR. The type of masonry mortar to be used for various kinds of masonry work shall be determined from Table 21.26-A. The mortar shall conform to the property requirements of Table 21.26-B1 and to the requirements of ASTM C-270 or shall be mixed in accordance with the proportions specified in Table 21.26-B.

(a) Surface bond mortars. Surface bond mortars for masonry walls shall be mixed in accordance with the proportions specified on the bag.

(4) MORTAR COMPONENTS. Mortar components shall comply with the following requirements:

(a) Water. Water shall be clean and free of deleterious amounts of acids, alkalies, or organic materials.

(b) Admixtures or mortar colors. Admixtures or mortar colors shall not be added to the mortar unless the resulting mortar conforms to the requirements of the mortar specifications. Only calcium chloride may be used as an accelerant and shall be limited to 2% by weight of the cement used. Calcium chloride may not be used for any other purpose. Only mineral oxide may be used as mortar color and shall not exceed 10% by weight of the cement used.

(c) Mixing. Mortar shall be mixed for at least 3 minutes after all ingredients have been added with the maximum amount of water to produce a workable consistency. Mortars that have stiffened due to water evaporation shall be retempered by adding water as frequently as needed to restore the required consistency. Mortars shall be used and placed in final position within 2 1/2 hours after mixing.

Note: To ensure proper mortar mixing, machine mixing is recommended.

TABLE 21.26-A

TYPES OF MORTAR FOR VARIOUS KINDS OF MASONRY

Kind of Masonry	Types of Mortar
Foundations:	
Footings	M, S
Walls of solid units	M, S, N
Walls of hollow units	M, S
Hollow walls	M, S
Masonry other than foundation masonry:	
Piers of solid masonry	M, S, N
Piers of hollow units	M, S
Walls of solid masonry	M, S, N, O
Walls of solid masonry not less than 12 in. thick or more than 35 ft. in height, supported laterally at intervals not exceeding 12 times the wall thickness	M, S, N, O
Walls of hollow units; load-bearing or exterior, and hollow walls 12 in. or more in thicknes	M, S, N
Hollow walls, less than 12 in. thic	M, S, N
Linings of existing masonry, either above or below grad	M, S
Masonry other than above	M, S, N

TABLE 21.26-B

MORTAR SPECIFICATIONS BY PROPORTION[1]

Mortar Type, ASTM C270	Parts by Volume			
	Portland Cement	Masonry Cement	Hydrated Lime	Sand, Damp Loose Volume
M	1	---	1/4	Not less than 2 1/2 and not more than 3 times the sum of the volumes of the cements and lime.
	1	1 (Type II)	---	
S	1	---	1/4 to 1/2	
	1/2	1 (Type II)	---	
N[2]	1	---	1/2 to 1 1/4	
	---	1 (Type II)	---	

1 All cements are one cubic foot per sack; lime equals 1 1/4 cubic foot per sack.

2 Limited to walls with a maximum depth of 5 feet below grade.

TABLE 21.26-B1

MORTAR PROPERTY REQUIREMENTS

Mortar Type	Compressive Strength Min. (psi)	Water Retention Min. (%)	Air Content Max. (%)
M	2,500	75	18
S	1,800	75	18
N	750	75	18

(d) Cementitious material. Cementitious material shall conform to the standards approved by the department.

Note: The department will accept cementitious material conforming to the following standards: ASTM C91, Masonry Cement; ASTM C150, Portland Cement; ASTM C595, Portland Blast-Furnace Slag Cement; ASTM C207, Hydrated Lime for Masonry Purposes; and ASTM C5, Quick Lime for Structural Purposes.

(e) Aggregates. Aggregates for use in masonry mortar shall consist of natural sand or manufactured sand and shall be graded.

Note: The department will accept aggregates in accordance with ASTM C144.

(5) CAVITY WALL. (a) Corbeling. Cavity wall construction may be supported on an 8-inch foundation wall provided the 8-inch wall is corbeled with solid masonry to the width of the cavity wall. Individual corbels shall not exceed 2 inches nor more than one-third the height of each corbeled unit.

(b) Projections. The projection of a wall beyond the edge of a supporting member other than masonry, such as a shelf angle or edge of a beam, shall not exceed 1 1/4 inches, unless at least 2/3 the mass of the wythe of masonry involved is located directly over the load-carrying member.

(c) Flashing. In exterior hollow walls exposed to the weather, flashing shall be installed at the bottom of the cavity formed by openings such as lintels over doors and windows and the backsides of chimneys so as to drain any water outward. Open vertical joints or weep holes of 3/8-inch minimum diameter shall be provided in the facing directly above the flashing at a horizontal spacing not exceeding 3 feet.

(6) OPENINGS AND LINTELS. (a) Openings. The masonry above openings shall be supported. The bearing length of structural elements which support the masonry above the opening shall be not less than 4 inches.

(b) Lintels. Unless designed through structural analysis, lintels shall be provided using either steel angles or reinforcing bars in accordance with Table 21.26-C.

TABLE 21.26-C

ALLOWABLE SPANS FOR LINTELS SUPPORTING MASONRY VENEER

Size of Steel Angle[1,3]	No Story Above	One Story Above	Two Stories Above	No. of 1/2" or Equivalent Reinforcing Bars[2]
L3 x 3 x 1/4	6'-0"	3'-6"	3'-0"	1
L4 x 3 x 1/4	8'-0"	5'-0"	3'-0"	1
L6 x 3 1/2 x 1/4	14'-0"	8'-0"	3'-6"	2
2 - L6 x 3 1/4 x 1/4	20'-0"	11'-0"	5'-0"	4

1 Long leg of the angle shall be placed in a vertical position.

2 Depth of reinforced lintels shall be not less than 8 inches and all cells of hollow masonry lintels shall be grouted solid. Reinforcing bars shall extend not less than 8 inches into the support.

3 Steel members indicated are adequate typical examples; other steel members meeting structural design requirements may be used.

(7) MASONRY VENEERS. (a) Veneer over frame construction. 1. Masonry veneers may be corbeled over the foundation wall, but the corbeling shall not exceed one inch.

2. An air space shall be provided between the veneer and the sheathing.

3. Where no brick ledge is formed in the foundation wall, corrosion resistant metal or other water resistant flashing shall extend over the top of the foundation wall from the

outside face of the wall and shall extend at least 6 inches up on the sheathing. The flashing shall be installed to drain any water outward.

4. Weep holes shall be provided at the bottom masonry course at maximum intervals of 2 feet.

(b) Veneer over masonry back-up. Corrosion-resistant metal or other water-resistant base flashing shall be provided at the bottom of the veneer and shall extend over the top of the foundation and up at least 6 inches and be embedded in the back-up course. The flashing shall be installed to drain any water outward. Weep holes shall be provided at maximum intervals of 3 feet.

(8) VENEER ANCHORAGE. All veneers, supports and attachments shall be mechanically or adhesively anchored.

(a) Mechanical anchorage. All anchors shall be corrosion-resistant.

1. Conventional size veneer (one square foot or less) shall be securely attached to its backing by anchors the equivalent of No. 22 U.S. gauge corrugated sheet steel 7/8 inch wide with at least one such tie located in every 2 square feet of wall. Ties shall be embedded 2 inches in a masonry joint and nailed to the framing with an 8d nail.

2. Large size veneer (greater than one square foot) shall be securely attached with anchors the equivalent of not less than 1/4-inch diameter bolts in accordance with either of the following:

a. Each unit individually anchored to the supporting framework with at least 3 anchors.

b. Individual units doweled to each other at all horizontal joints and anchored to the backing at all horizontal and vertical joints so that one anchor is provided for every 6 square feet of wall surface.

(b) Adhesive anchorage. Veneer may be cemented to a masonry or concrete wall or to exterior portland cement plaster in high rib galvanized metal lath with an adhesive, provided that the bond is sufficient to withstand a shearing stress of 50 psi after curing for 28 days.

(9) BEARING. (a) Concentrated loads. Beams, girders, trusses, joists and other members producing concentrated loads shall bear a minimum of 3 inches on one of the following:

1. Concrete beam. The equivalent of a nominally reinforced 2,500 psi concrete beam 8 inches in height.

2. Solid masonry. At least 8 inches in height of masonry composed of solid masonry units with all voids and joints completely filled with mortar.

3. Metal plate. A metal plate of sufficient thickness and size to distribute the load to masonry units. For piers and columns, the bearing plate shall not exceed 60% of the cross-sectional area of the pier or column and the resultant reaction of all vertical and horizontal loads shall fall within the middle third of the member.

4. Bond beam. The bond beam shall be the equivalent of not less than an 8-inch lintel (bond beam) block with 2 No. 4 bars embedded in high strength mortar fill or equivalent. The loads shall bear on the fill.

(b) Continuous loads. Joists, trusses and beams other than wood, spaced 4 feet or less on center and 40 feet or less in length, slabs or other members causing continuous loads shall be transmitted to masonry with a minimum bearing of 3 inches upon solid masonry at least 2 1/2 inches in height, or as indicated for concentrated loads.

(c) Stack bond walls. Concentrated loads shall be distributed into masonry laid in stack bond by a concrete beam or bond beam [as defined in (a)]. For masonry of solid units, 2 additional rows of a continuous tie assembly may be used instead of a concrete beam or bond beam.

(d) Support of wood floor members. Where a wood structural member is buried in masonry for support, it shall be firecut or a self-releasing device shall be used. Where the end of a wood structural member is built into an exterior wall, a 1/2-inch air space shall be provided at the sides, top and end of such member.

(10) BONDING. Unless designed through structural analysis, all masonry walls shall be bonded as follows:

(a) Single-wythe walls. Masonry units in single-wythe walls shall be lapped at least 2 inches or one-third the height of the masonry unit, whichever is greater, or through the use of continuous tie assemblies spaced at 16-inch vertical intervals.

(b) Multi-wythe walls. Adjacent wythes shall be bonded with continuous tie assemblies spaced at vertical intervals not exceeding 16 inches; or individual ties of at least 3/16-inch diameter for each 4 1/2 square feet of wall area, spaced at a maximum vertical distance of 18 inches and a maximum horizontal distance of 36 inches; or bonded with a full course of masonry headers every seventh course. The clear distance between bond courses shall not exceed 16 inches for solid masonry units and 24 inches for hollow masonry units. Hollow walls shall not be bonded with headers.

(11) BOLTS AND ANCHORS. The allowable shear on steel bolts and anchors shall not exceed the values given in Table 21.26.

TABLE 21.26

ALLOWABLE SHEAR ON BOLTS AND ANCHORS

Bolt or Anchor Diameter (inches)	Embedment1 (inches)	Allowable Shear (pounds)
1/4	4	270
3/8	4	410
1/2	4	550
5/8	4	750
3/4	5	1100
7/8	6	1500
1	7	1850
1 1/8	8	2250

1 Bolts and anchors shall be solidly embedded in mortar or grout.

(12) JOINTS. (a) The maximum thickness of a mortar joint shall be 1/2 inch.

(b) Except for head joints used for weepholes and ventilation, solid masonry units shall be laid to achieve full head and bed joints.

(c) Hollow masonry units shall be laid with full head joints and full bed joints under the full bearing areas of the face shells and under webs where the adjacent cells are to be filled with grout.

(13) CLEANING. Chemical cleaning agents shall be prevented from harming the metal reinforcement of structural components and shall not be of a strength which will adversely affect the mortar.

Subchapter VIII — Roof and Ceilings

Comm 21.27 Roof design.

(1) ROOF LOADS. (a) General. Roof and roof/ceiling assemblies shall support all dead loads plus the minimum live loads as set forth in par. (b) and s. Comm 21.02.

(b) Slope roof snow loads. Snow loads specified in s. Comm 21.02 (1) (b) 2. may be reduced for roof slopes greater than 30° by multiplying the snow load by Cs. The value of Cs shall be determined by the following: Cs = 1 - (a-30) where a is the slope of the roof expressed in degrees.

Roof Loads

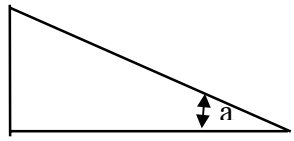
Question: *Can maximum spans of roof rafters be increased through the use of collar ties?*
Answer: *No, unless structural calculations are provided to document the acceptability of the design. Collar ties are already minimally required by s. Comm 21.28(2) to resist roof deflection and do not increase the allowable span of the rafters.*

Sloped Roof Snow Loads

This section allows reduction of snow loads on roofs sloped more than 30 degrees. This means a reduction may be taken on roofs with greater than a 7:12 slope. This reduced design snow load may be transmitted down through the structure including any headers or beams. (See Examples.)

However, it must be remembered that s. Comm 20.02 also requires a 20 PSF wind load acting on the vertical roof projection.

Reduced Snow Load for High Slope Roofs = Cs X Design Snow Load
Cs = [1 - (a - 30)]/40
a = angle in degrees



Rise/Run = Slope = tan a
Arctan(slope) = a

Slope	a	Zone 1 PSF	Zone 2 PSF
7/12	30	40	30
10/12	40	30	22.5
12/12	45	25	18.8
14/12	50	20	15

(2) UPLIFT AND SUCTION FORCES. Roofs shall withstand a pressure of at least 20 pounds per square foot acting upward normal to the roof surface. Roof overhangs, eaves, canopies and cornices shall withstand an upward wind pressure of at least 20 pounds per square foot applied to the entire exposed area.

(a) Anchorage. Roofs shall be anchored to walls and columns to resist uplift.

(b) Stress increase. All stresses may be increased by a maximum of one-third for wind forces.

(3) WATER. All roofs shall be designed and constructed to assure drainage of water.

(a) Roofing. 1. General. a. Underlayment consisting of number 15 asphalt-impregnated felt paper or equivalent or other type I material that shows no water transmission when tested in accordance with ASTM D 226 or ASTM D 4869 shall be provided under shingles.

Note: Underlayment materials meeting the requirements of ASTM D 1970 meet the performance requirements of this section.

b. Fasteners shall be corrosion resistant.

Note 1: See Comm 20.07 (62) for definitions of shingle terms.

Note 2: The Residential Asphalt Roofing Manual can be purchased from the Asphalt Roofing Manufacturers Association at 6000 Executive Boulevard, Suite 201, Rockville, Maryland 20852-3803. This manual contains extensive information on shingles from manufacture through installation, inspection and maintenance. It includes a recommendation that properly driven and applied nails are the preferred fastening system for asphalt shingles.

Note 3. Section Comm 20.04 (2) requires compliance with all parts of this code, including these roofing provisions, for an alteration to any dwelling that is regulated under this code.

2. Asphalt shingles. a. Organic asphalt shingles shall conform to ASTM D 225 and the Class C requirements of ASTM E 108, and shall pass the wind resistance test of ASTM D 3161.

b. Fiberglass asphalt shingles shall conform to ASTM D 3462 except that laminated shingles shall have a tear strength of at least 1450 grams in each ply.

c. Shingles that have a self-sealing adhesive strip shall include a sealant which has an average bond strength of at least 1.5 pounds per 3.75 inches of shingle width, at 32°F.

Note: The department will accept the results of testing conducted in accordance with an approved test method for verifying compliance with the sealant uplift resistance required in this subparagraph. Information on the applicable test method may be obtained from the department.

d. Each shingle package shall be labeled by the manufacturer to indicate conformance to the applicable ASTM standard for each type of shingle or the exception in subpar. b.

e. Shingles shall be installed in accordance with the manufacturer's recommendations. Shingles shall have at least 4 fasteners per strip shingle or 2 fasteners per interlocking shingle. Shingle head lap shall be at least 2 inches.

Roofing

Question: *Can metal roofing be used?*
Answer: *The requirements under s. Comm 21.27 for roof design makes no reference to the specific type of material that can or cannot be used as a roof covering. Therefore, metal roofing material is acceptable if installed consistent with the manufacturer's instructions.*

Question: *Can re-roofing be done without removing the existing layers of roofing?*
Answer: *The subject of the number of layers of roofing materials that can be placed on a roof system is not addressed in the dwelling code specifically. However, the design loads of the roof rafter or trusses should not be exceeded. The span tables in the UDC assume dead loads that will typically allow a total of two lightweight roof layers. Additionally, the installation of the roof covering materials would have to be in accordance with the manufacturer's recommendations, installation instructions, and warranty provisions.*

(b) *Ice dam protection*. 1. Shingled or shake roofs that extend over a heated area of a dwelling or attached garage and that have a slope of 4:12 or less shall be provided with ice dam protection in the form of sheet metal or a product labeled as meeting the requirements of ASTM D 1970.

2. The ice dam protection shall extend at least 30 inches up the roof slope from the roof edge and at least 12 inches up the roof slope beyond the inner face of the exterior wall.

(4) FLASHING. Flashings shall be installed at the junction of chimneys and roofs, in all valleys, and around all roof openings.

(a) Valley flashing. 1. Open valleys. Open valleys shall be flashed with at least No. 28 gauge galvanized, corrosion-resistant sheet metal, 16 inches wide, or a layer of at least 50-pound roll roofing, 16 inches wide, placed over a layer of 15-pound roofing underlayment. Flashing sections shall be overlapped by at least 4 inches.

2. Closed valleys. Where shingles are laced or woven over the valley, the valley shall be flashed with at least one layer of 50-pound roofing, at least 20 inches wide, over the layer of 15-pound roofing underlayment.

(b) Chimney flashing. 1. Chimney crickets shall be installed where the upper side of a chimney is more than 30 inches wide on a sloping roof. The intersection of the cricket and the chimney shall be flashed and counter-flashed to a height of at least 4 inches.

2. Chimneys not exceeding 30 inches wide shall be flashed and counter-flashed to a height of at least 6 inches.

3. Chimney sides shall be flashed to a height of at least 4 inches.

Comm 21.28 Roof and ceiling wood framing.

Unless designed through structural analysis, wood rafters and ceiling joists, and components, shall comply with the requirements of s. Comm 21.02 (3).

(1) ROOF RAFTERS. (a) Ridge boards. 1. Where rafters meet to form a ridge, the rafters shall be attached to a ridge board.

2. The ridge board shall have a depth at least equal to the length of the cut end of the rafter abutting it.

3. Where all rafters are placed directly opposite each other or are offset at the ridge board by less than the thickness of the rafter, the ridge board shall have a nominal thickness of at least 1 inch.

4. Where one or more rafters are offset at the ridge board by more than the thickness of the rafter, the ridge board shall have a nominal thickness of at least 2 inches.

(b) Bearing. The required bearing for wood rafters shall be in accordance with the National Design Specification for Wood Construction published by National Forest Products Association. In no case shall the bearing be less than 1 1/2 inches on wood or metal or less than 3 inches on masonry or concrete.

(2) Anchorage. Roofs shall be anchored to resist horizontal thrust and uplift. Provisions shall be taken to absorb the horizontal thrust produced by the sloping roof, rafters or beams through collar ties installed in the upper third of the roof rafters on every third pair of rafters; or through the use of cross ties connecting beams; or through the use of metal straps or metal plates located at the ridge which tie the roof beams together. Rafters shall be notched to fit the exterior wall plate and fastened to the wall.

Thrust Anchorage of Rafters

Question: *Shouldn't this section require collar ties in the lower one-third of the rafter spans to adequately resist the lateral roof thrust?*

Answer: *No. This section assumes rafter framed roof construction with ceiling joists fastened to the ends of the rafters at the wall plate. Horizontal thrust is resisted by both the collar ties at the upper one-third of the roof and the ceiling joist at the base of the roof. Additionally, the collar ties provide longitudinal roof stability.*

(2m) Cathedral ceilings. In cathedral ceilings, the upper end of the rafters shall be supported by a ridge beam or bearing wall, or thrust restraint shall be provided per s. Comm 21.02.

(3) CEILING JOISTS. Ceiling joists shall be nailed to exterior walls and to the ends of rafters. Where joining over interior parititions, they shall be nailed to the plate or to each other. Where ceiling joists are placed at right angles to the rafters, as in flat or hip roofs, the lookout joist or ties shall be fastened to the parallel ceiling joists or rafters.

(4) VALLEY AND HIP RAFTERS; LADDERS. (a) Valley rafters. Where no bearing is provided under valley rafters at the intersection of 2 roof areas, the valley rafters shall be doubled in thickness and shall be at least 2 inches deeper than the required common rafter to permit full bearing at the beveled end. Where ridges are provided at different elevations, care should be taken to provide vertical support for the interior end of the lower ridge board.

(b) Hip rafters. Where no bearing is provided under hip rafters, the hip rafters shall be of the same thickness as common rafters and shall be at least 2 inches deeper to permit full contact with the jack rafter.

(c) Ladders. Overhangs at gable end walls of more than 12 inches shall be provided with ladders (rafters which extend over the wall) which extend into the structure a distance no less than the length of the overhang. The ladders shall be fastened at the wall. The interior end of each ladder shall be attached to a rafter or truss with a hanger.

(5) ROOF TRUSSES. Metal plate connected wood roof trusses shall be designed in accordance with the Design Specifications for Metal Plate Connected Wood Trusses and the National Design Specification for Wood Construction. Truss members shall not be cut, bored or notched.

(6) NOTCHING AND BORING. (a) General. 1. Notching and boring of beams or girders is prohibited unless determined through structural analysis.

2. Notching and boring of ceiling joists and rafters shall comply with pars. (b) and (c).

(b) Notching. 1. Notches located in the top or bottom of ceiling joists and rafters are prohibited from all of the following:

a. Having a depth exceeding 1/6 the depth of the member.

b. Having a length exceeding 1/3 the depth of the member.

c. Being located in the middle 1/3 of the span of the member.

2. Where ceiling joists or rafters are notched at the ends, the notch may not exceed ¼ the depth of the member.

3. Bird mouth cuts may not exceed 1/3 the depth of the rafter unless the seat cut bears fully on the wall plate.

(c) Boring. 1. Holes bored within 2 inches of the top or bottom of ceiling joists or rafters may not be located in the middle 1/3 of the span of the member.

2. The diameter of a hole may not exceed 1/3 the depth of the member.

3. A hole may not be bored within 2 inches of a notch or another hole.

4. The distance between adjacent holes may not be less than the diameter of the larger hole.

(d) Engineered wood products. Notching or boring of engineered wood products shall be done in accordance with the manufacturer's instructions provided those instructions were

developed through structural analysis or product testing. Trusses shall be anchored in accordance with standards and recommendations published by the Truss Plate Institute.

(7) ROOF SHEATHING, BOARDS AND PLANKING. (a) Plywood sheathing. Plywood sheathing and similar sheathing materials which are rated by the APA shall be grade marked and stamped and limited to the allowable loads and spans indicated in Table 21.28-A.

(b) Roof boards. Roof boards shall comply with the minimum thicknesses shown in Table 21.28-B.

(c) Roof planks. Roof planks shall be tongue and groove or splined and at least 2 inches, nominal, in thickness. Planks shall terminate over beams unless the joints are end matched. The planks shall be laid so that no continuous line of joints will occur except at points of support. Planks shall be nailed or fastened to each beam.

TABLE 21.28-A

ALLOWABLE LOADS AND SPANS FOR PLYWOOD ROOF SHEATHING
CONTINUOUS
OVER TWO OR MORE SPANS AND FACE GRAIN PERPENDICULAR
TO SUPPORTS[1,2,3]

		Maximum Span (inches)		Load (in pounds per square foot)	
Panel Span Rating	Plywood Thickness (inches)	Edges Blocked	Edges Unblocked	Total Load	Live[4] Load
12/0	5/16	12	12	40	30
16/0	5/16, 3/8	16	16	40	30
20/0	5/16, 3/8	20	20	40	30
24/0	3/8	24	20	40	30
24/16	7/16, 1/2	24	24	50	40
32/16	15/32, 1/2, 5/8	32	28	40	30
40/20	19/32, 5/8, 3/4, 7/8	40	32	40	30
48/24	23/32, 3/4, 7/8	48	36	45	35

1 Spans shall be limited to values shown, based on possible effect of concentrated loads.

2 Underlayment, C-C Plugged, sanded exterior type: allowable uniform load based on deflection of L/360 span for spans 24 inches or less is 125 psf; and for spans 48 inches, 65 psf.

3 Plywood sheathing may be installed with face grain parallel to supports in accordance with the "APA Design/Construction Guide", APA, P.O. Box 11700, Tacoma, WA 98411.

4 Assumes 10 psf dead load.

TABLE 21.28-B

MINIMUM THICKNESS OF ROOF BOARDS

	Minimum Net Thickness (inches)	
Rafter Spacing (inches)	Solid Sheathing	Spaced Sheathing
24	5/8	3/4

Subchapter IX —Fireplace Requirements

Comm 21.29 Masonry fireplaces.

Masonry fireplaces shall be constructed of masonry, stone or concrete. Masonry fireplaces shall be supported on foundations of concrete or masonry. Structural walls shall be at least 8 inches thick. Masonry fireplaces shall conform to the following requirements:

(1) FLUE SIZE. The fireplace flue size shall be based on the type of flue and the fireplace opening indicated in Table 21.29.

TABLE 21.29

MINIMUM FLUE SIZE FOR MASONRY FIREPLACES

Type of Flue	Minimum Cross-Sectional Area
Round	1/12 of fireplace opening but not less than 75 square inches
Square or rectangular	1/10 of fireplace opening but not less than 75 square inches

(2) TERMINATION OF CHIMNEY. Masonry fireplace chimneys shall extend at least 3 feet above the highest point where the chimney passes through the roof and at least 2 feet higher than any portion of the dwelling within 10 feet of the chimney.

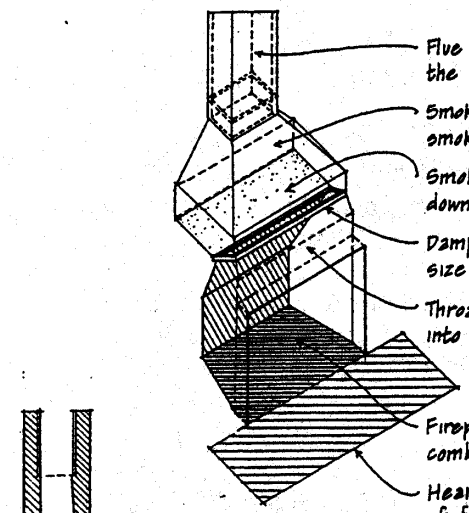
(3) FIREBOX MATERIALS. The firebox shall be of the preformed metal type, at least 1/4 inch thick, or listed by a nationally recognized laboratory; or shall be lined with firebrick, at least 2 inches thick and laid in thin joints of refractory cement. The back and sidewalls of the firebox, including the lining, shall be at least 8 inches nominally thick masonry, at least 4 inches of which shall be solid.

(4) LINTEL. Masonry over the fireplace opening shall be supported by a lintel of steel or masonry.

(5) DUCTS. Warm-air circulating ducts shall be constructed of masonry or metal.

(5m) RETURN AIR GRILLES. Return air grilles shall not be located in bathrooms, kitchens, garages, utility spaces or in a confined space defined under s. Comm 23.06 in which a draft diverter or draft regulator is located.

Commentary

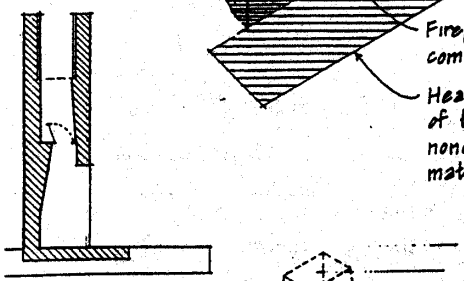


A fireplace should be designed and constructed to:

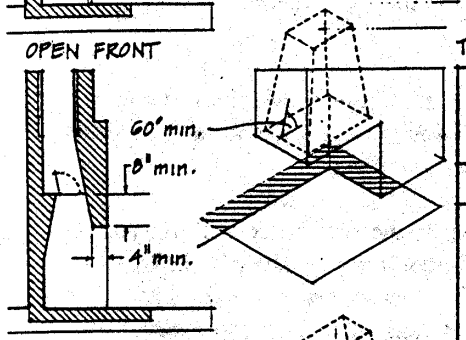
- Sustain the combustion of the fuel
- Draw properly to carry smoke and other combustive by-products to the outside
- Radiate the maximum amount of heat comfortably into the room
- Ensure proper distances from combustible materials.

Thus the dimensions and proportions of a fireplace and its flue, and the arrangement of its components, are subject to the laws of nature and the requirements of the building and mechanical codes.

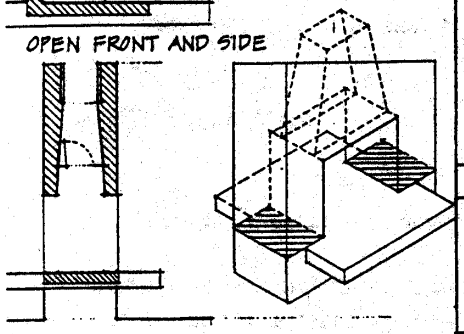
The table below provides typical dimensions for three types of fireplaces.



OPEN FRONT



OPEN FRONT AND SIDE



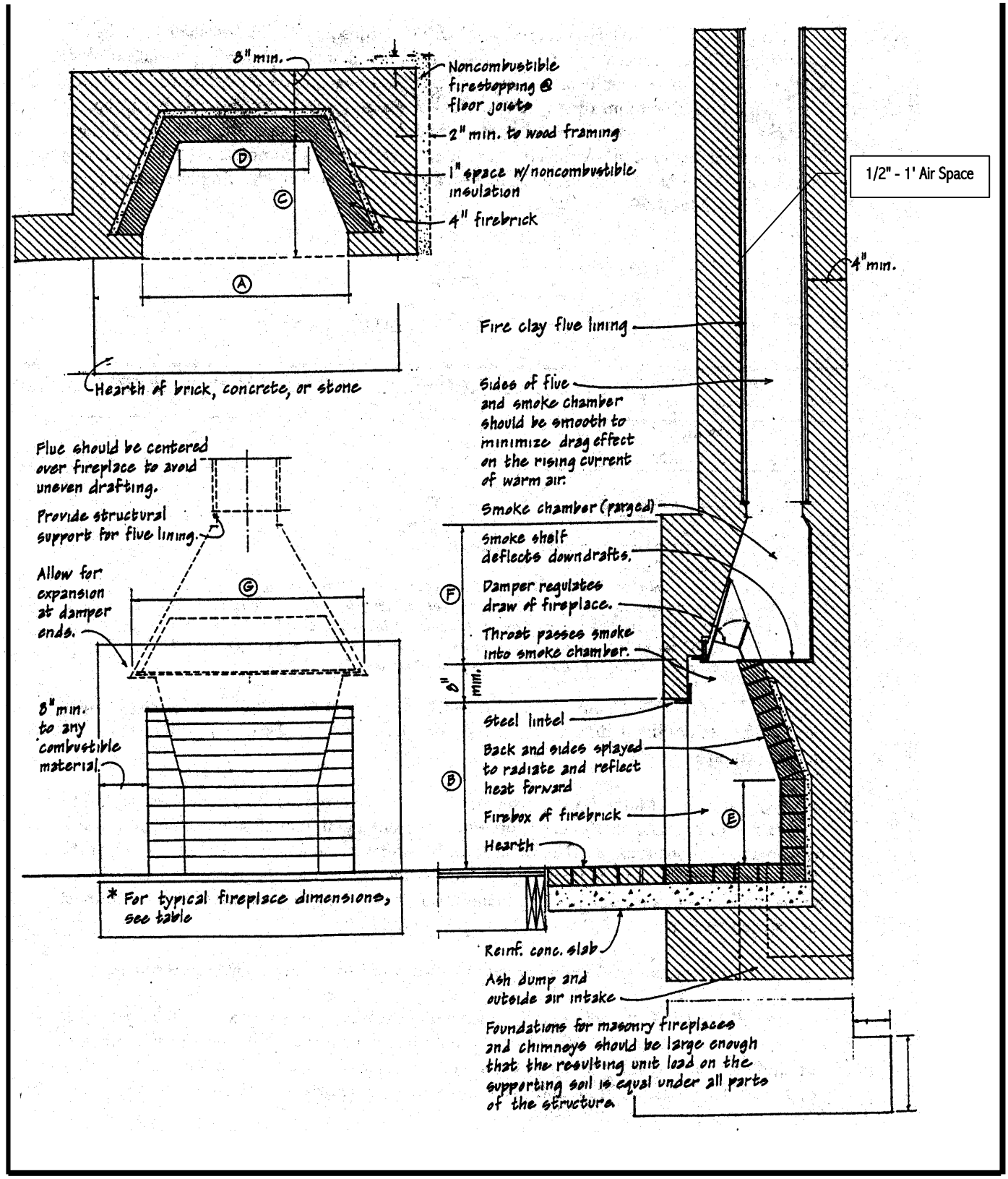
OPEN FRONT AND BACK

Multifaced fireplaces are especially susceptible to drafts in a room; avoid placing their openings opposite an exterior door.

TYPICAL FIREPLACE DIMENSIONS (inches)

Width (A)	Height (B)	Depth (C)	Back width (D)	Vertical back (E)	Smoke chamber (F)	Damper width (G)	Flue size
OPEN FRONT							
24	24	16	11	14	19	32	8 x 12
28	24	16	15	14	21	36	8 x 12
32	29	16	19	14	24	40	12 x 12
36	29	16	23	14	27	44	12 x 12
42	32	16	29	14	32	50	16 x 16
48	32	18	33	14	37	56	16 x 16
54	37	20	37	16	45	60	16 x 16
60	40	22	42	16	45	72	16 x 20
72	40	22	54	16	56	84	20 x 20
OPEN FRONT AND SIDE							
28	24	16					12 x 12
32	28	18					12 x 16
36	30	20					12 x 16
48	32	22					16 x 16
OPEN FRONT AND BACK							
28	24	16					12 x 12
32	28	16					12 x 16
36	30	17					12 x 16
48	32	19					16 x 16

Commentary


8" min.
Noncombustible firestopping @ floor joists
2" min. to wood framing
1" space w/noncombustible insulation
4" firebrick
D
C
A
Hearth of brick, concrete, or stone
1/2" - 1' Air Space
4" min.
Fire clay flue lining
Sides of flue and smoke chamber should be smooth to minimize drag effect on the rising current of warm air.
Smoke chamber (parged)
Smoke shelf deflects downdrafts.
Damper regulates draw of fireplace.
Throat passes smoke into smoke chamber.
F
8" min.
Steel lintel
Back and sides splayed to radiate and reflect heat forward
B
Firebox of firebrick
E
Hearth
Flue should be centered over fireplace to avoid uneven drafting.
Provide structural support for flue lining.
Allow for expansion at damper ends.
G
8" min. to any combustible material.
* For typical fireplace dimensions, see table
Reinf. conc. slab
Ash dump and outside air intake
Foundations for masonry fireplaces and chimneys should be large enough that the resulting unit load on the supporting soil is equal under all parts of the structure.

(6) HEARTH EXTENSION. (a) Masonry fireplaces shall have a hearth extension made of noncombustible material.

(b) The structural support for the hearth and hearth extension shall be a minimum of 4 inches of reinforced concrete.

(c) There shall be no structural framing material within 1 inch of the hearth or hearth extension in any direction. Any wooden forms or supports used during construction shall be removed.

(d) The minimum dimensions of the hearth extension shall be in accordance with Table 21.29-1.

TABLE 21.29-1

HEARTH EXTENSION DIMENSIONS

Fireplace Opening (square feet)	Extension from Fireplace Opening (inches)	
	Side	Front
Less than 6	8	16
6 or greater	12	20

Hearth Extension

Question: *How is the hearth extension measured?*
Answer: *The hearth or hearth extension is measured from the face of the fireplace opening and not from the front of the firebox, spark screen, or glass doors. The face of the fireplace includes any trim materials provided on the front of the fireplace. Earlier editions of the UDC permitted measurement from the firebox, but as of the 1989 Edition, the measurement is to be taken from the* ***face of the fireplace opening***.

(7) DAMPERS. Dampers shall be made of cast iron or at least No. 12 gauge sheet metal. The area of the damper opening shall be at least 90% of the required flue area when in the open position.

(8) HOODS. Metal hoods, used in lieu of a masonry smoke chamber, shall be constructed of at least No. 19 gauge corrosion-resistant metal with all seams and connections of smokeproof construction. The hood shall be sloped at an angle of 45° or less from the vertical and shall extend horizontally at least 6 inches beyond the firebox limits. Metal hoods shall be kept a minimum of 18 inches from the combustible materials unless approved for reduced clearances.

Note: The department will accept dampers and hoods listed by nationally recognized laboratories.

(9) FLUE LINERS. (a) Flue liners shall be installed in accordance with s. Comm 21.30 (7) and this section.

(b) Flue liners shall start at the top of the fireplace throat and extend to a point at least 4 inches above the top of the chimney cap.

(c) Firebrick may be used in the throat of the fireplace as an inlet to the flue liner.

(10) CLEANOUT OPENINGS. Fireplaces with ash dumps shall be provided with cleanout openings at the base. Doors and frames of the opening shall be made of ferrous materials.

(11) MANTEL SHELVES AND COMBUSTIBLE TRIM. Woodwork or other combustible materials shall not be placed within 6 inches of the fireplace opening. Combustible materials located within 12 inches of the fireplace opening shall not project perpendicularly more than 1/8 inch for each inch distance from the opening.

(12) FRAMING AROUND FIREPLACES. Combustible materials located near fireplaces shall be installed in accordance with s. Comm 21.30 (9).

Framing Around Fireplaces

Question: *This section refers to 21.30(9) which requires 2-inch clearances from fireplace masonry to combustibles. In some cases, the block and brick may cover an entire wall. In such a case, is it necessary to maintain the 2-inch clearance from the entire wall?*

Answer: *Because of the expected heat dissipation in such an installation, the department will accept the ends of the beams and headers to be placed without a 2-inch clearance if at least 12 inches of solid masonry is also provided between the member and the firebox or chimney flue. If the wood structural member is supported in the masonry, it must be fire cut or a self-releasing device must be used as required by s. Comm 21.26(9)(d).*

Note the requirement for clearances to a fireplace applies only to framing. Other combustible elements such as mantles, trim, and flooring would need to comply with the s. Comm 21.29(11), as well as the hearth requirements of s. Comm 21.29(6).

(13) CORBELING. Unless designed through structural analysis, masonry chimneys shall not be corbeled from a wall more than 6 inches nor shall a masonry chimney be corbeled from a wall less than 12 inches in nominal thickness unless it projects equally on each side of the wall. The corbeling shall not exeed one-inch projection for each brick course.

Comm 21.30 Masonry chimneys.

Masonry chimneys shall conform to the following provisions:

(1) MATERIALS. No masonry chimney shall rest upon wood. The foundation shall be designed and built in conformity with the requirements for foundations. Masonry chimney walls shall be at least 4 inches in nominal thickness. Hollow cored masonry units may be used to meet the 4-inch nominal thickness requirement.

(2) FLUE SIZE. Chimney flues for appliances shall be at least equal in area to that of the area of the connector from the appliance.

(3) MULTIPLE FLUE SEPARATION. When more than one flue is contained in the same chimney, a masonry separation of at least 4 inches nominal in thickness shall be provided between the individual flues. The joints of adjacent flue linings shall be staggered by at least 7 inches.

(4) CORBELING. Unless designed through structural analysis, masonry chimneys shall not be corbeled from a wall more than 6 inches nor shall a masonry chimney be corbeled from a wall less than 12 inches in nominal thickness unless it projects equally on each side of the wall. The corbeling shall not exceed one-inch projection for each brick course.

(5) INLETS. Inlets to masonry chimneys shall enter the side and be provided with thimbles. Thimbles shall be at least No. 24 manufacturer's standard gauge (0.024 inch) or 5/8-inch thick, refactory material. Each chimney shall have an inlet installed at the time of construction.

(6) CLEAN-OUT OPENING. Every masonry chimney shall be provided with a clean-out opening at the base. Such openings shall be equipped with metal doors and frames arranged to remain closed when not in use. Clean-out openings shall be located below the lowest inlet to the flue.

(7) FLUE LINERS. (a) Masonry chimneys shall be lined with a material that will resist corrosion, softening and cracking at temperatures up to 1800°F, such as vitrified clay sewer pipe or minimum 5/8-inch thick fire clay lining material.

(b) All flue liners shall be laid in a full bed of refractory mortar or refractory cement.

(c) Variations in inside and outside dimensions shall not exceed 1/4 inch for clay flue liners.

(d) There shall be a minimum clearance of 1/2 inch and a maximum clearance of 1-inch between the flue liner and the chimney walls.

(e) Unless serving a masonry fireplace under s. Comm 21.29, the flue liners shall commence at the chimney footing.

Flue Liners

Question: *If a stainless steel flue liner is used, what gauge stainless steel may be used to line a masonry chimney?*

Answer: *Stainless steel of 22 gauge or thicker is acceptable.*

(8) CHIMNEY CAPS. Chimneys shall be provided with precast or cast-in-place concrete chimney caps. Chimney caps shall have a minimum thickness of 2 inches, shall slope outwards away from the flue, and shall provide a one-inch overhang and drip edge on all sides. A slip joint shall be installed between the flue and the cap. The slip joint shall be filled with 1/4 inch felt or similar material and shall be caulked with high-temperature caulk or similar material to prevent water infiltration.

(9) CLEARANCE TO COMBUSTIBLES. (a) The minimum clearance between combustibles and masonry chimneys which have any portion located within the exterior wall of the dwelling shall be 2 inches. The minimum clearance between combustibles and masonry chimneys which have all parts completely outside the dwelling, exclusive of soffit or cornice areas, shall be one inch.

(b) Except as required under pars. (c) and (d), the clearance spaces shall remain completely open.

(c) The clearance spaces between chimneys and wood joists, beams, headers or other structural members shall be fireblocked at each floor level from chimney footing all the way to the roof flashing with galvanized steel, at least 26 gage thick or with noncombustible sheet material.

(d) Noncombustible material shall be used to prevent entry of debris into the clearance spaces.

Fireblocking of Chimneys

Question: *The Uniform Dwelling Code requires 2 inches of clearance between combustible headers, beams, rafters, joists and studs and the outside face of a interior chimney (1 inch for an exterior chimney). Does subs. Comm 21.08(1) on fire separation also apply where this rule states "holes around ducts and pipes shall also be fire stoped"?*

Answer: *Yes. It is the intent for s. Comm 21.08(1) to apply to the 2-inch or 1-inch clearance between the chimney and the structural members. Noncombustible fire blocking material must be used. In addition, insulation is not acceptable for fire blocking metallic chimneys or vents as this would cause "hot spots" to occur and most likely harm them and/or void the manufacturer's testing.*

Comm 21.32 Factory built fireplaces.

Factory-built fireplaces consisting of a fire chamber assembly, one or more chimney sections, a roof assembly and other parts shall be tested and listed by a nationally recognized testing laboratory.

(1) FIREPLACE ASSEMBLY AND MAINTENANCE. The fireplace assembly shall be erected and maintained in accordance with the conditions of the listing.

(a) All joints between the wall or decorative facing material and the fireplace unit shall be completely sealed, firestopped or draft-stopped with a noncombustible caulk or equivalent.

(b) Doors installed on factory built fireplaces shall conform with the terms of the listing and the manufacturers installation instructions for the fireplace unit.

(2) DISTANCE FROM COMBUSTIBLES. Portions of the manufactured chimney extending through combustible floors or roof/ceiling assemblies shall be installed in accordance with the distances listed on the chimney in order to prevent contact with combustible materials.

(3) HEARTH EXTENSIONS. Hearth extensions shall be provided in accordance with the manufacturer's listing. Where no hearth extension is specified in the listing, a hearth extension shall be provided in accordance with s. Comm 21.29 (6).

Factory-Built Fireplaces

The department conducted an investigation regarding factory-built fireplace installations. As a result of the investigation, it was felt special consideration should be given to two important installation requirements that are especially important to proper operation of such fireplaces.

Per s. Comm 21.32, factory-built fireplaces and their specified chimneys shall be tested and listed by a nationally recognized testing laboratory. Furthermore, the fireplace assembly and chimney shall be erected and maintained in accordance with the conditions of the listing. Currently acceptable testing and listing laboratories for this and other purposes are listed below. Not all will test all classes of appliances.

- *Underwriter's Laboratories (UL)*
- *Electrical Testing Labs of New York (ETL-NY)*
- *Energy Testing Labs of Maine (ETL-MAINE)*
- *Canadian Standards Association (CSA)*
- *Product Fabrication Service (PFS)*
- *Warnock Hersey*

Specific emphasis should be placed on inspection of the construction gap between the front of the fireplace unit and the finish material or facia. Most, if not all, manufacturers require the gap be filled with noncombustible caulk or equivalent. The fear, although not specifically

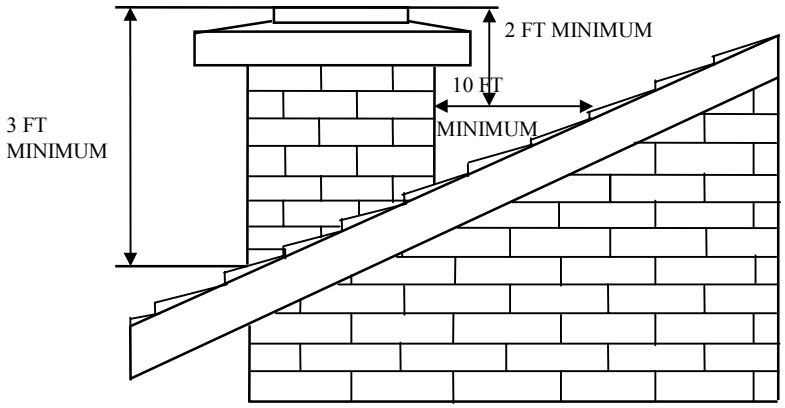
verified by our investigation, is that hot gases or sparks can migrate out of the fire box through such an opening and eventually cause ignition of the unprotected combustibles behind the facia. Improper drafting could increase the likelihood of such an occurrence.

Typically the crack between the fireplace and hearth must also be properly sealed against entry of sparks and coals if there is combustible flooring below.

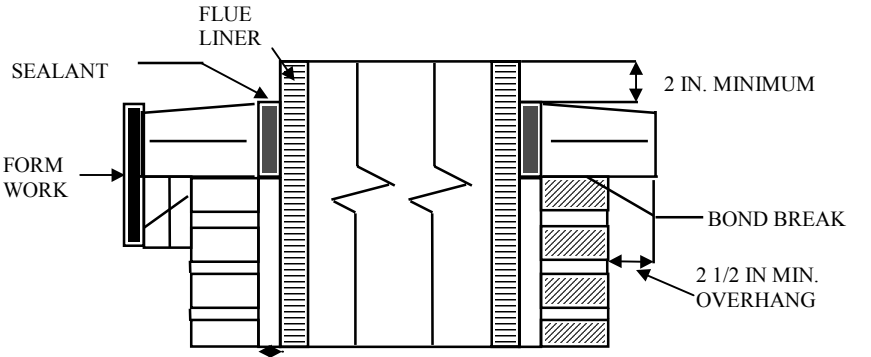
The use of any add-on items should be closely checked as to whether they are listed for that particular fireplace. Be especially suspicious of retrofitted stoves or fireplace inserts which can cause severe problems if the fireplace was not designed for them.

Also, fireplace doors should be checked to verify that they are of a type made by the fireplace manufacturer and approved for installation on that model. Oversize doors could restrict combustion air supply, block air circulation vents or slots that cool the unit or even deflect heat or hot gases laterally into the construction gap between the front of the unit and the surrounding facia as described above.

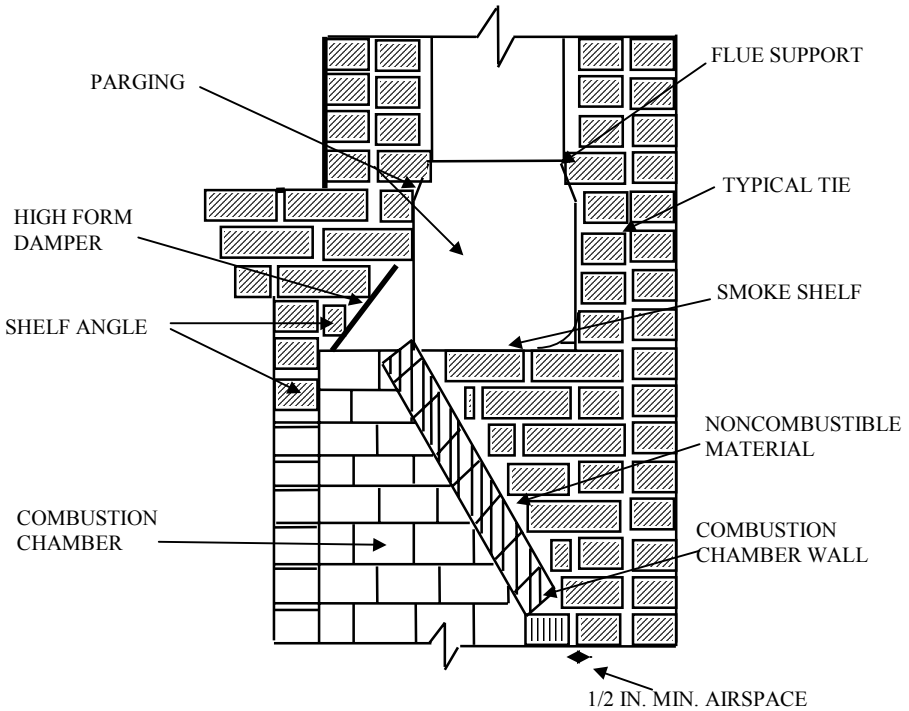
In conclusion, all manufacturer's installation requirements should be followed. An inspector is entitled to request a copy of manufacturer's installation instructions, per s. Comm 20.09(4)(b), in order to conduct proper inspections.

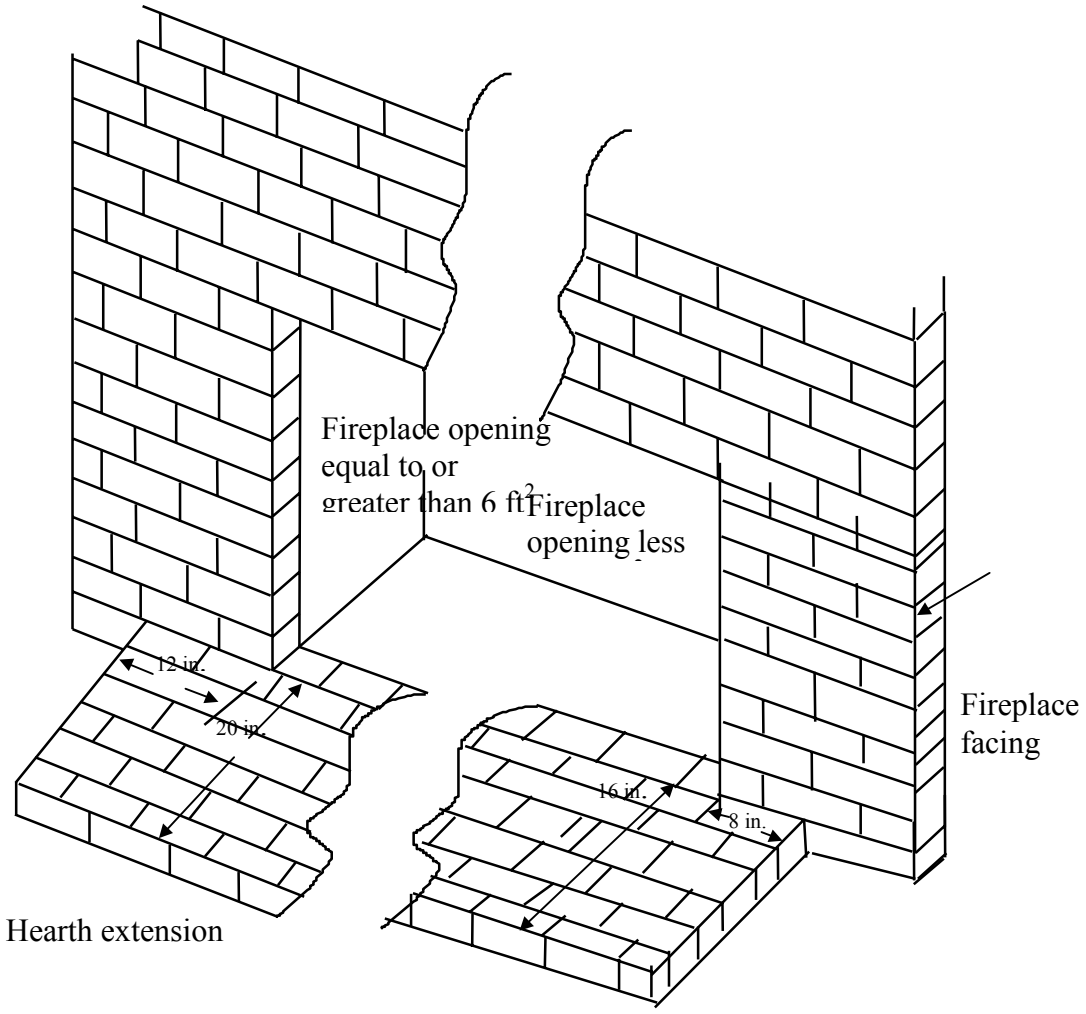


Building Code Dimension



CHIMNEY CAP





Fireplace hearth extension requirements

Question: *Many pre-manufactured fireplace installation instructions require a noncombustible insulating material be placed between the hearth extension finish material and the combustible floor. Is this noncombustible insulating board required by the UDC?*

Answer: *Indirectly, yes. Section Comm 21.32(1) requires the entire fireplace installation be installed per the manufacturer's listing. The hearth extension design is part of the listing. The insulating board specifications vary between fireplace manufacturers. For example, some "Preway" Models requires either of two of its products, "Preway" HE 36-1 or HE 3624. An alternative material should be equal to 3/4-inch thick noncombustible insulating material with a thermal conductivity of k = 0.55 (Btu)-(In)/(Hr)(sq ft) (^{o}F). As an alternative to k-value, a 3/4-inch noncombustible material with a thermal conductance C = .73 or thermal resistance R = 1.36 is acceptable. Besides the Preway products mentioned, other trade name products such as "Celotex CV 230", "Micore" and "Spec 300" boards may also be acceptable (check k-values).*

Gas Fireplaces

Question: *Are gas-only fireplaces required to have a hearth extension per the UDC?*

Answer: *No. Gas-only fireplaces are covered by s. Comm 23.04 as a gas appliance and need to be installed per their listing, which typically may not require a hearth extension.*

Factory-Built Fireplace Chimneys

Question: *Does the requirement of s. 23.045(3)(a)1., that factory-built chimneys be tested to 2,100dF ("high-temperature" rated) if connected to a solid-fuel appliance, apply to a factory-built fireplace?*

Answer: *No. Section 23.045 applies to solid-fuel appliances other than those covered by other sections of the code such as masonry and factory-built fireplaces (ss. Comm 21.29 through 21.32). The proper chimney for a factory-built fireplace is the one it was tested and listed with and is normally shipped with the unit. It is possible that such listed fireplace assemblies will have a lower temperature chimney.*

Subchapter X —— Construction in Floodplains

Comm 21.33 Construction in floodplains.

(1) GENERAL. Where dwelling construction is allowed by local zoning ordinances to take place in floodfringe areas of floodplains, the dwelling shall meet the requirements of this subchapter.

Note: The department of natural resources (DNR) and the federal emergency management agency (FEMA) also have regulations that apply to construction in floodfringe areas.

(2) ELEVATION. (a) General. Except as provided in pars. (b) and (c), all dwellings constructed within a floodfringe area shall be elevated so the lowest floor and all basement floor surfaces are located at or above the base flood elevation.

(b) Certified floodproof basements. Floodproof basements may have the top of the basement floor no more than 5 feet below the base flood elevation provided the basement is designed by a registered architect or engineer to be watertight and impermeable. No limitation is placed on the use or occupancy of a certified floodproof basement by the provisions of this subchapter.

(c) Other enclosed spaces. 1. Enclosed spaces not meeting the requirements of par. (b) are allowed at any depth below the base flood elevation provided the spaces are used only for one or more of the following purposes:

a. Means of egress.

b. Entrance foyers.

c. Stairways.

d. Incidental storage of portable or mobile items.

2. Fully enclosed spaces used only for those purposes listed in subd. 1. shall be designed to automatically equalize the hydrostatic pressure on exterior walls by allowing the entry and exit of floodwaters. Designs for meeting this requirement shall be certified by a registered architect or engineer or shall meet all of the following requirements:

a. There shall be at least two pressure relieving openings and the openings shall have a total net area of not less than one square inch for every square foot of enclosed area subject to flooding.

b. The bottom of all openings shall be no more than 12 inches above grade.

c. Openings may not be equipped with screens, louvers, valves or other coverings or devices unless such devices permit the automatic entry and discharge of floodwaters.

(3) CERTIFICATION OF ELEVATION. A registered land surveyor, architect or engineer shall certify the actual elevation in relation to mean sea level of the lowest structural member required to be elevated by the provisions of this subchapter.

(4) ANCHORAGE. The structural systems of all dwellings shall be designed, connected and anchored to resist flotation, collapse or permanent lateral movement due to structural loads and stresses at the base flood elevation.

(5) PROTECTION OF ELECTRICAL AND MECHANICAL SYSTEMS. Electrical and mechanical equipment shall be placed above the base flood elevation or shall be designed to prevent water contact with the equipment in case of a flood up to the base flood elevation.

(6) CONSTRUCTION MATERIALS AND METHODS. All dwellings constructed in floodplains shall be constructed using materials and methods designed to minimize flood and water damage.

Comm 21.34 Construction in coastal floodplains.

(1) GENERAL. All dwellings constructed in coastal floodplains shall be designed by a registered architect or engineer and shall meet the requirements of this section and section Comm 21.33.

(2) ELEVATION. All dwellings constructed in a coastal floodplain shall be elevated so the lowest portion of all structural members supporting the lowest floor, with the exception of mat or raft foundations, pilings, piling caps, columns, grade beams and bracing, is located at or above the base flood elevation.

(3) ENCLOSURES BELOW BASE FLOOD ELEVATION. Enclosures below the base flood elevation in a coastal floodplain may not be used for human occupancy and shall be free of all obstructions, except for non-loadbearing walls and partitions. Non-loadbearing walls and partitions below base flood elevation shall be constructed to break away without causing any structural damage to the elevated portion of the dwelling or foundation system due to the effect of wind loads and water loads acting simultaneously.

(4) FOUNDATIONS. All dwellings located in a coastal floodplain shall be supported and anchored on pilings or columns. The piling or column shall have adequate soil penetration to resist combined water and wind loads at the base flood elevation. Piling or column design shall consider the effect of scour of soil strata. Mat or raft foundations to support columns may not be used where soil under the mat or raft is subject to scour or other erosion from wave flow conditions.

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